

WHAT IS CLAIMED IS:

1. Apparatus for identifying the composition of a sample, the apparatus comprising:
 - a light source of known wavelength and deviation,
 - 5 radiation optics coupled to the light source so that light emitted from the light source is directed toward a region on a sample surface causing the sample to produce a characteristic spectrum,
 - sampling optics situated to receive the characteristic spectrum produced from the sample and direct it toward a spectral analyzer, and
- 10 an objective lens common to both the radiation optics and the sampling optics, a holder for the objective lens, and apparatus for moving the objective lens holder in a plane generally parallel to the sample surface so that the light emitted from the light source moves relative to the sample sufficiently to lower the average power density of the light arriving at the region on the sample surface
- 15 below any light induced detrimental change threshold of the sample.
2. The apparatus of claim 1 wherein the objective lens is eccentrically mounted within the lens holder, and further comprising a motor for rotating the lens holder to achieve movement of the light on the sample surface.
3. The apparatus of claim 1 further comprising a motor for vibrating the lens holder to achieve movement of the light on the sample surface.
- 20 4. The apparatus of any of claims 1-3 wherein the radiation optics and sampling optics share a common filter, the filter acting on the radiation optics to reflect the light emitted from the light source toward the sample, the filter acting in the sampling optics to block light at the wavelength of the light source from entry into the spectral analyzer.
- 25 5. The apparatus of claim 4 further comprising a band pass filter situated at an output of the light source to define further the deviation of the source.
6. The apparatus of claim 4 further comprising a probe including a
- 30 housing having an optical window, the radiation optics optically coupling the light source to the housing optical window so that light emitted from the light source is directed through the window toward a sample causing the sample to produce a characteristic spectrum.

7. The apparatus of claim 6 wherein the probe housing includes a handle to permit manipulation of the probe and further comprises a trigger coupled to the light source.

8. The apparatus of claim 6 wherein the housing comprises an 5 elongated rail having a lower and an upper surface and a tubular member including a longitudinal slot receiving the rail so that an axis of revolution of the tubular member is parallel to the rail upper surface and is aligned with said optical window.

9. The apparatus of claim 8 further comprising a plurality of supports 10 fixed to the rail upper surface for supporting optical elements to intersect the axis of revolution, a back plate closing one end of the tubular member, and a nose cone closing another end of the tubular member, the nose cone containing the optical window.

10. The apparatus of claim 8 further comprising a band pass filter 15 situated in the housing in spaced relation from the light source, and a baffling tube fixed within the housing contiguous to the band pass filter to form a segregated region within the housing for absorbing radiation reflected by the band pass filter.

11. The apparatus of claim 7 wherein said trigger is connected to said 20 motor so that depression of the trigger causes movement of the objective lens holder in a plane generally perpendicular to an axis of the holder passing through the optical window.

12. The apparatus of claim 11 wherein the movement of the objective lens holder is between about 0.1 and 100 cm/sec.

25 13. The apparatus of claim 11 wherein the movement of the objective lens holder is at a frequency of between about 0.1 and 100 Hz.

14. The apparatus of claim 11 wherein the movement of the objective lens holder is rotational between about 0.1 and 100 rev/sec.

30 15. The apparatus of claim 14 wherein the objective lens is eccentrically positioned within the lens holder by about 0.05 to 1.0 cm.

16. Apparatus for identifying the composition of a sample, the apparatus comprising:

a probe including a housing having an optical window located on an axis of

6500 6400 6300 6200 6100 6000 5900 5800 5700 5600 5500 5400 5300 5200 5100 5000 4900 4800 4700 4600 4500 4400 4300 4200 4100 4000 3900 3800 3700 3600 3500 3400 3300 3200 3100 3000 2900 2800 2700 2600 2500 2400 2300 2200 2100 2000 1900 1800 1700 1600 1500 1400 1300 1200 1100 1000 900 800 700 600 500 400 300 200 100 0

the probe, and a light source of known wavelength and deviation situated within the probe,

radiation optics coupled to the light source so that light emitted from the light source is directed through the optical window toward a region on a sample
5 surface causing the sample to produce a characteristic spectrum,

sampling optics situated to receive the characteristic spectrum produced from the sample through the optical window and direct it toward a spectral analyzer, and

10 an objective lens common to both the radiation optics and the sampling optics, a holder for the objective lens situated adjacent to the optical window, and apparatus for moving the objective lens holder in a plane generally perpendicular the probe axis so that the light emitted from the light source moves relative to the sample sufficiently to lower the average power density of the light arriving at the region on the sample surface below any light induced detrimental change
15 threshold of the sample.

17. The apparatus of claim 16 wherein the objective lens is eccentrically mounted within the lens holder, and further comprising a motor for rotating the lens holder to achieve movement of the light on the sample surface.

18. The apparatus of claim 17 wherein the movement of the objective
20 lens holder is rotational between about 0.1 and 100 rev/sec.

19. The apparatus of claim 17 wherein the objective lens is eccentrically positioned within the lens holder by about 0.05 to 1.0 cm.

20. The apparatus of any of claims 16-19 wherein the probe housing includes a handle to permit manipulation of the probe and further comprises a
25 trigger coupled to the light source and the motor so that depression of the trigger causes movement of the objective lens holder in a plane generally perpendicular to an axis of the housing passing through the optical window.

21. The apparatus of claim 20 wherein the radiation optics and sampling optics share a common filter, the filter acting on the radiation optics to
30 reflect the light emitted from the light source toward the sample, the filter acting in the sampling optics to block light at the wavelength of the light source from entry into the spectral analyzer.

22. The apparatus of claim 20 wherein the housing comprises an

elongated rail having a lower and an upper surface and a tubular member including a longitudinal slot receiving the rail so that an axis of revolution of the tubular member is parallel to the rail upper surface and is aligned with said optical window.

5 23. The apparatus of claim 22 further comprising a plurality of supports fixed to the rail upper surface for supporting optical elements to intersect the axis of revolution, a back plate closing one end of the tubular member, and a nose cone closing another end of the tubular member, the nose cone containing the optical window.

10 24. The apparatus of claim 22 further comprising a band pass filter situated in the housing in spaced relation from the light source, and a baffling tube fixed within the housing contiguous to the band pass filter to form a segregated region within the housing for absorbing radiation reflected by the band pass filter.

15 25. The apparatus of claim 20 further comprising a band pass filter situated at an output of the light source to define further the deviation of the source.